SARPI
Servicio Autónomo Registro
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MINISTRY OF ECONOMIC DEVELOPMENT

FP-02 00605
LETTERS PATENT

TYPE OF PATENT

☐ USEFULNESS MODEL ✕ INVENTION ☐ INDUSTRIAL DESIGN

IDENTIFICATION

PRIORITY	REGISTRATION	RECORD
COUNTRY: _____ REGISTRY No. ____ DATE: _____	No. 221/92 DATE: 02-14-1992	No. 52,882 DATE: 02-14-1992 EXPIRATION: 02-14-2012

DESCRIPTION

TECHNICAL TITLE OF THE INVENTION OR CREATION:

"METHOD TO REDUCE FRICTION IN DRILLING FLUIDS"

OWNER(S) AND ADDRESSES: JERRY J. RAYBORN, with legal residence in Franklynton, Louisiana, United States of America

THE ABOVE OWNER HAS THE RIGHT TO USE, SELL, AND MANAGE THE OBJECT OF THE PRESENT INVENTION, A RIGHT THAT CAN BE TRANSFERRED TO HIS HEIRS AND ASSIGNS. THE STATE DOES NOT GUARANTEE THE ACCURACY, PRIORITY OR USEFULNESS OF THE INVENTION, PATENTED IMPROVEMENT, MODEL OR DRAWINGS. THE PERTINENT FEES WERE PAID PURSUANT TO RECEIPT No. 799 OF 02-14-1992 THE FIRST ANNUAL INSTALLMENT (Bs. 100.00) AND PURSUANT TO RECEIPT No. 51553 OF 12-5-94 THE DOCUMENTARY TAX (Bs 4.00) AND PROTOCOL PAPER (Bs. 1.00) TOTAL Bs. 105.00 CARACAS SEPT. 04 OF 1995 SIGNATURE OF PARTY OF RECORD /s/ Illegible [Rubber Stamp of SARPI]	FACSIMILE OF DRAWING OR INDUSTRIAL MODEL (AFFIXED WITH GLUE)

BACKGROUND OF THE INVENTION

This application is a partial continuation of pending application Serial No. 719,944 filed on September 2, 1976.

CLAIMS

This invention refers to a new and improved method to reduce the torque, drag and wear on the drill piping strings and bore used in the drilling of an oil well. There are other important characteristics related thereto, some of which are described in detail below.

DESCRIPTION OF THE PREVIOUS ART

In U.S. Patent No. 3,216,933 it is suggested that hard particulate materials be used in the drilling fluid to prevent jamming of the drill pipe. Examples of such materials are steel shot, sand, aluminum shot, nut shells, plastic, etc. The steel and aluminum shot have relatively high specific gravities and will tend to settle in the muds of normal weight. This can be particularly troublesome when the drilling stops for one reason or another because there is the possibility that the shot will settle in the mud in the drill string and will accumulate in the drill bit. In some cases, this can result in plugging of the bit. U.S. Patent No. 2,943,679 suggests the use of nut shells and hard plastic in the drilling fluid to decrease the frictional drag on the drilling string. However, in both patents, these particulate materials are described as "ground" and are, therefore, irregular in shape.

SUMMARY OF THE INVENTION

Briefly, this invention refers to a new and improved method in the use of plastic beads in a well in order to reduce friction in the well bore that occurs between the

DESCRIPTION OF THE PREFERRED EMBODIMENT

A drilling mud is a combination of water, clay and various treating agents that control the physical or rheological properties of the drilling mud in a well bore.

In the drilling of a well, the obvious objective is to produce normally hydrocarbons, water, etc., and the drilling mud serves to remove the chips or cuttings that are produced by the rotating bit from the well bore by circulating the drilling mud downward from the surface of the well through the drill string and outward through openings in the bit so that the drilling mud then circulates upward in the annulus between the side of the well bore and the rotating drill string.

One of the objectives of a drilling mud is to reduce friction or to provide a lubricating medium for the drill bit and for the drill pipe while the well bore is being drilled.

Friction is normally defined as a relative resistance to motion of the contact surfaces. In the drilling of well bores, friction must be overcome through lubrication, thus allowing the surfaces that are creating the unwanted friction to glide conveniently over each other. Some materials that are being considered at the present time as lubricating materials to be used in drilling mud to reduce friction are water, diesel oil, vegetable oil, detergents, bentonite clays, alcohols, Gilsonite, asphaltic materials, cellulose materials, polymers, dextrose materials, glycerins and amines.

The applicant has found out that the addition of plastic spheres of the type described in detail below to drilling mud essentially reduces friction among the drill bit, the drill string, and the well bore. Therefore, in accordance with the applicant's method, the drill string rotates to cut open a well bore in the ground while circulating a drilling

The size of the beads can vary in a substantial range, for example, from 10 to 100 mesh (Tyler standard screen size). A preferred range is 40 to 60 mesh. The preferred bead is one that is available commercially and that consists of a copolymer of divinyl benzene and styrene. These beads come in a range of 10 to 100 mesh. This maximum amount of beads must be such that they will pass through the shale shaker. The size distribution of the particle within these ranges is not generally of sufficient importance so as to warrant any special attention.

The chemical composition and polymeric structure of the beads shall be such that they will not be crushed during operation in the well. They must be solid; insoluble in oil and water; stable at the temperature in the bottom of the well hole that ranges, for example, up to 250 F; they must be inert to well fluids both physically and chemically and have a specific gravity in the range of 1.1 to 1.5. In this latter sense, the beads that have a specific gravity higher than 1.5 will tend to settle in lighter weight drilling muds if circulation ceases. The heavier beads will tend to settle in the mud pits.

The plastic beads must be almost perfect. It is believed that the spherical shape is important to provide the torque reducing properties so that, when two metallic surfaces tend to rub against each other, for example, a drill pipe against a casing or a hard shale, the existing beads between said surfaces act as ball bearings to lessen the contact between the hard surfaces. A study of the particles returned in the mud cake, under magnification, has shown that the beads appear to be partially embedded in the surface of the mud cake, leaving a semi-spherical surface exposed in order to have contact with the drill string. Observation of this type of filter cake could lead one to believe that there are many hundreds of these diminutive protuberances of beads for each foot of bore hole.

EXAMPLE ONE

An operator who was drilling an oil well had "high torque and drag" problems in an offshore well and sought help.

The well being drilled was a 37 degree directional well with several offsets or dog legs. The well was a nine and a half hole that was being drilled at 11,200 feet with 4,000 feet of 10 ¾ inch casing. The measured total depth of the well was to be 13,400 feet and the torque had already reached 850 amps on a conventional torque gauge. The torque was such that the operator was simply letting the drill pipe rotate. Plastic beads were added to the mud that was pumped through the drill pipe and reached the casing, after which the torque immediately decreased to 600-650 amps and the rotation speed increased up to 20 revolutions per minute. The well was drilled the remaining 2,000 feet to completion using the plastic beads.

EXAMPLE TWO

The same operator had placed in another well approximately 13,000 feet of casing, and the necessary arrangements were being made to displace the existing mud with an oil-based mud since the torque and drag conditions were too severe for the plastic beads to provide the required torque reduction. The system was treated with "slug" with 5% per volume of the drilling mud containing plastic beads and 300 mud barrels. As soon as the mud loaded with beads reached the annulus of the well bore, torque began to decrease and the penetration rate of the drill string increased by 50%. The well was completed at 18,000 feet with the beads and, once the work had ended, the mud system contained 1 ¾ per cent per bead volume in relation to the drilling mud

cent per volume of drilling mud, and the torque decreased to 600-625 amps as indicated in the torque gauge, and the well was completed.

In the preceding examples, the plastic beads were of divinyl benzene and styrene copolymer; their mesh size varied from 10 to 100, and they were spherical in shape.

CLAIMS

1. The method for drilling a well, consisting of the rotation of a drill string to cut a hole in the ground:

To circulate a mud drill through the drill strings and from there upward through the annulus between the drill string and the wall of the hole;

To maintain the required torque to rotate the drill string and, when said torque becomes undesirably high, to add sufficient solid spherical plastic beads to reduce torque;

Said beads are smooth and have a mesh size in the range of 10 to 100, but are sufficiently small to pass through any shale shaker that is used in the drilling operation;

Said beads are made of plastic and have a specific gravity in the range of 1.1 to 1.5 and are insoluble in hydrocarbons and water and, in addition, have physical properties such that there is no material crushing of the beads during the drilling operation.

2. The method, in accordance with claim 1, where the beads have a screen size in the range of 40 to 60 mesh.

3. The method, in accordance with claim 1, where the amount of added beads is at least 4 pounds per barrel.

To keep the torque required to make the drill string turn and, when it becomes undesirably high, to add 4 to 10 pounds per barrel of solid plastic beads through a mud hopper and mix them with the drilling mud and circulate the resulting mix through the drill pipe, outside the bit and to the annulus of the well bore, thus reducing the torque required to make the drill string turn;

Said beads have a screen size in the range of 10 to 100 mesh; this size is determined by the mesh size of the rig shaker, so that the beads will pass through the shaker screen and remain in the drilling mud to be circulated again; what is needed is to keep the beads in the drilling so that they can circulate again.